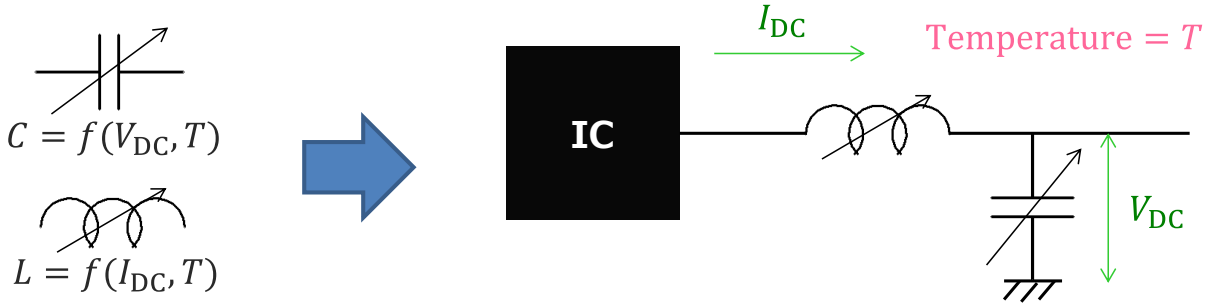
Introduction of Temperature/DC Bias Model and User-specified Temp./Bias Model

Multilayer Ceramic Capacitors (High dielectric type)
Power Inductors

Introduction

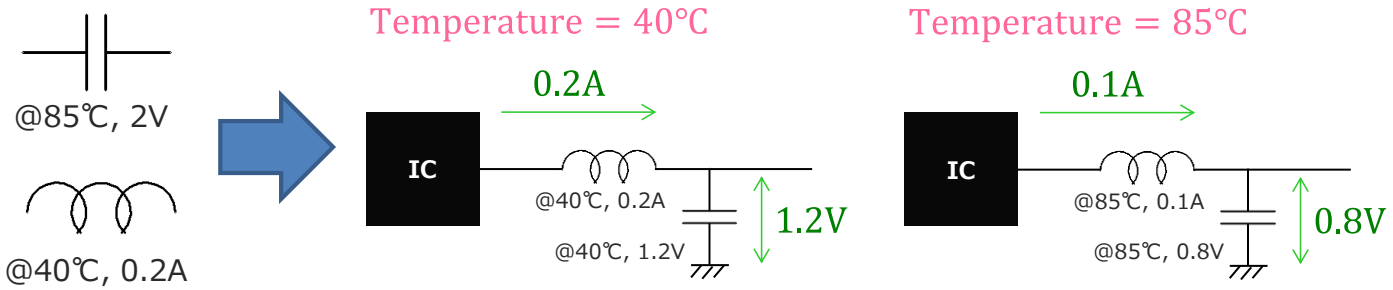
We are providing models that reflect the temperature and DC bias dependencies of capacitors and inductors!

Temperature/DC Bias Model



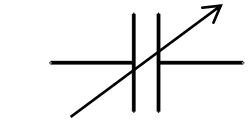
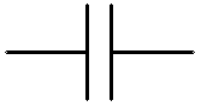
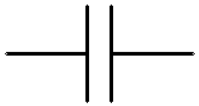
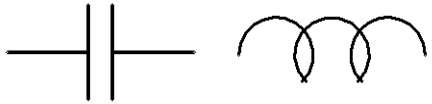
Available for various temperature and DC bias

User-specified Temp./Bias Model



You can specify the temperature and DC bias corresponding to your environment when downloading the model.

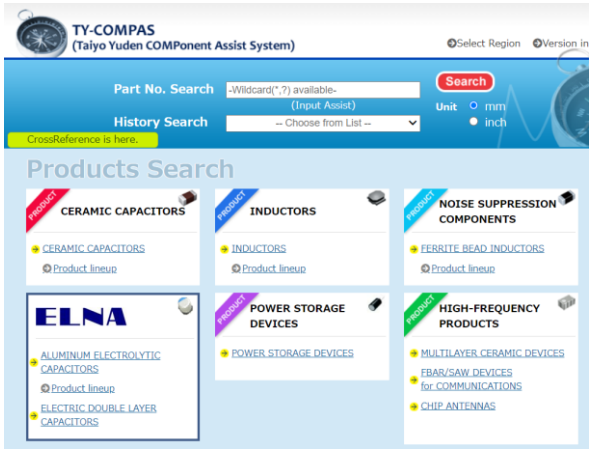
Model variations and features

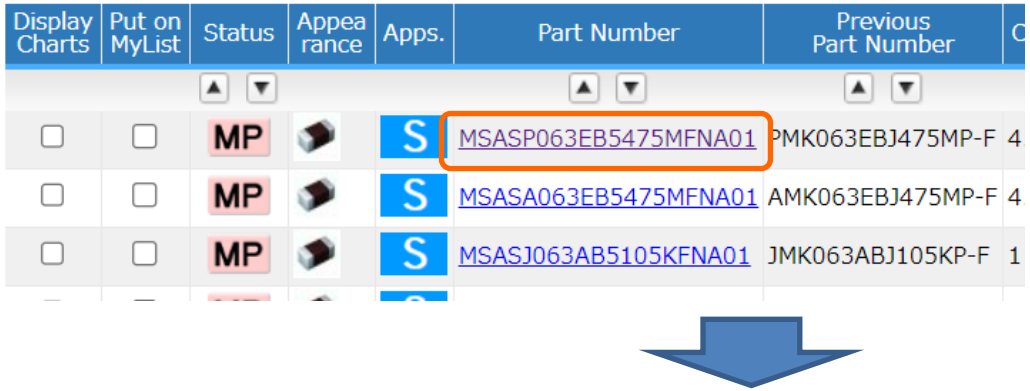
	Temperature/DC Bias Model	*New* User-specified Temp./Bias Model	Standard Model
Images	 $C = f(V_{DC}, T)$  $L = f(I_{DC}, T)$	  @85degC, 2V @40degC, 0.2A  @-55degC, 1V etc.	 25degC, 0V only
Temperature	Changeable (specify on schematic)	Fixed (specify@DL) ex. -55, 25, 85℃	Fixed（25degC only）
DC Bias	Automatically following to applied DC bias	Fixed (specify@DL) ex. 0, 2, 4V/A	Fixed（0V/A only）
Simulation Accuracy/ Speed	High accuracy/ Relatively slow	Normal accuracy/ Fast	Normal accuracy/ Fast

We are providing 2 types of adaptive models to temperature and dc bias dependencies of high dielectric ceramic capacitors and power inductors.

Download page

https://ds.yuden.co.jp/TYCOMPAS/or/searcherMain





MLCC

MSASP063EB5475MFNA01

Specify Temp./ Bias

Temp.	85	℃	(-55~85)
DC bias	2	V	(0~2.5)

Download S-parameter | SPICE model

MSASP063EB5475MFNA01_85degC_DC2V.cir

MSASP063EB5475MFNA01_85degC_DC2V.s2p

Simulation data

- About Temperature/DC bias model
- S-parameter(1 Product)
- S-parameter(Series)[zip]
- SPICE model(1 Product)[cir]
- SPICE model(Series)[lib]
- SPICE model(Series)[zip]
- Temperature/DC bias model(LTspice)[zip]
- Temperature/DC bias model(PSpice)[zip]
- Temperature/DC bias model(HSPICE)[zip]
- Temperature/DC bias model(Spectre)[zip]
- 3D model (STEP)
- Land Pattern(DXF)
- User-specified Temp./Bias model [.s2p, .cir]

MSASP063EB5475_FNA01_LT.zip

You can download models by following the download link at description page of each product.

Download page of Libraries and manuals

If you would like to download models of our components all at once, please visit the library download page below.

https://www.yuden.co.jp/or/product/support/com_lib/

Also, how-to-install-and-use manuals for Temperature/DC bias model are available from links below.

PSpice

https://www.yuden.co.jp/productdata/com_lib/en/PSM_E.pdf

LTspice

https://www.yuden.co.jp/productdata/com_lib/en/LTM_E.pdf

HSPICE

https://www.yuden.co.jp/productdata/com_lib/en/HSM_E.pdf

Spectre

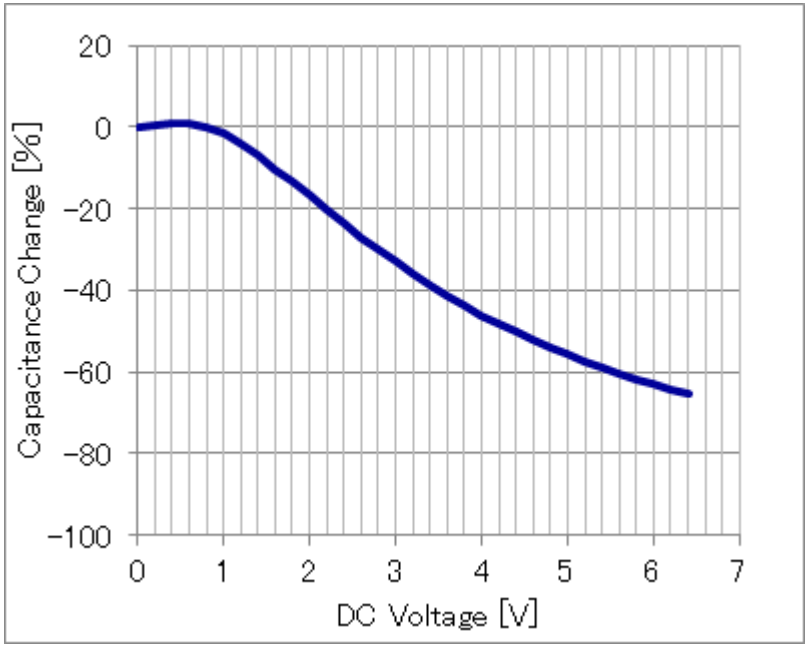
https://www.yuden.co.jp/productdata/com_lib/en/SPM_E.pdf

More Informations of Temperature/DC bias Model

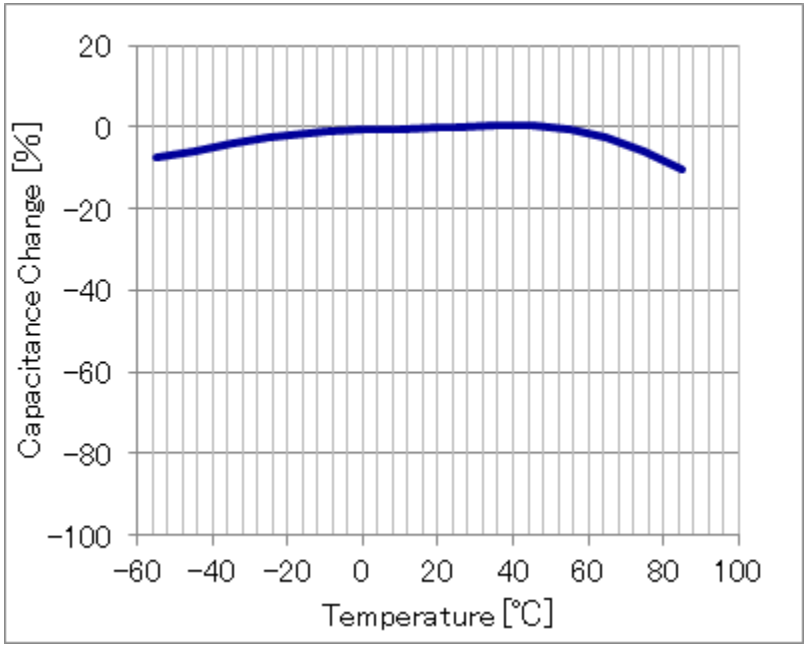
Temperature/DC Bias Characteristics of Capacitors

Multilayer Ceramic Capacitor 47uF

DC Bias Characteristics (120Hz)



Temperature Characteristics (120Hz)



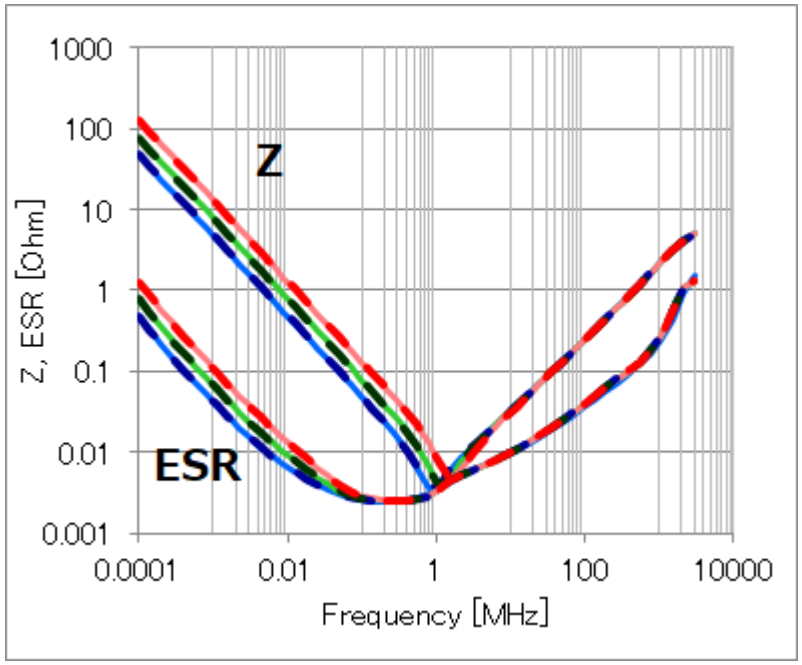
Multilayer ceramic capacitors composed of high dielectric materials are known to vary their characteristics by temperature and/or DC bias voltage.

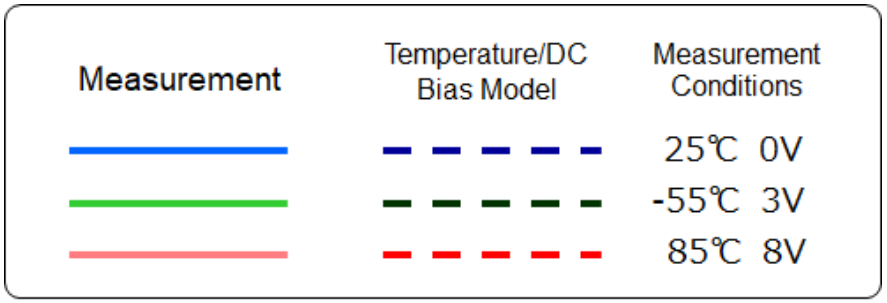
Therefore, temperature-DC-bias-dependent models are needed to perform simulations more precisely in condition that the ambient temperature and/or DC bias voltage varies.

Temperature/DC bias model and measurement data

Multilayer Ceramic Capacitor 47uF

Frequency Characteristics





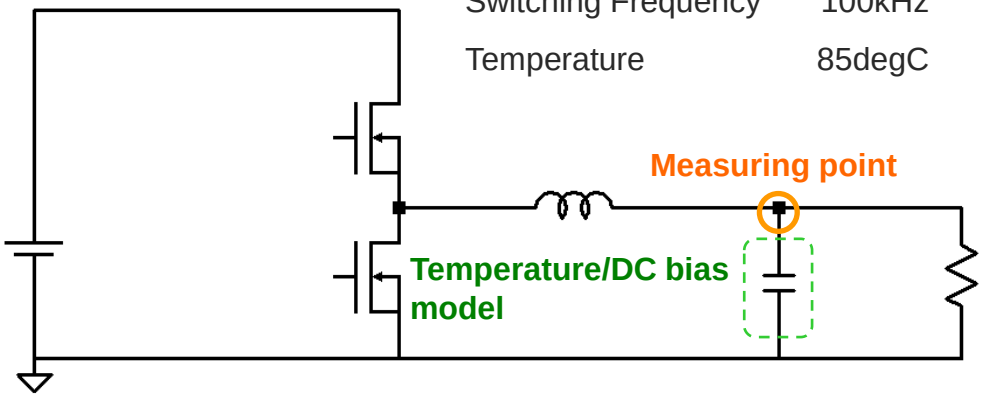
By using Temperature/DC bias model, you can perform simulations well fitting to actual data dependent on the ambient temperature and DC bias current.

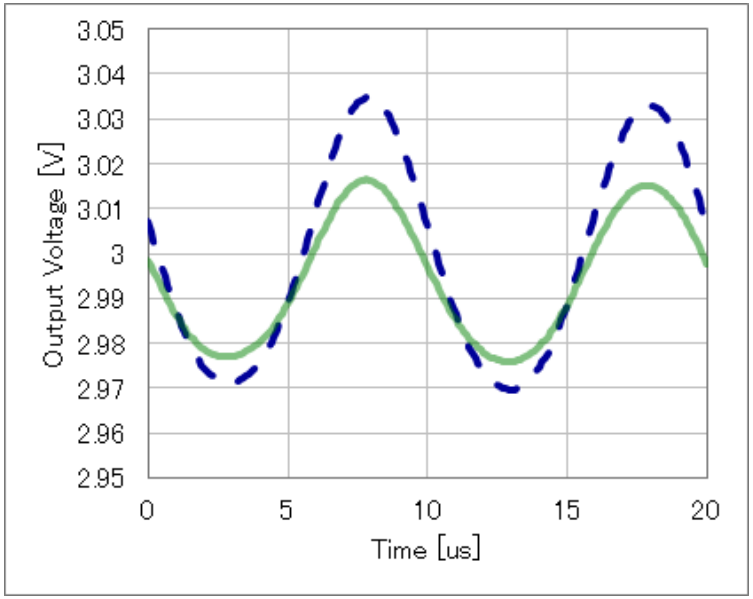
That is first achieved by Temperature/DC bias model, but not realized by the legend model.

Simulation example (DC-DC converter)

Multilayer Ceramic Capacitor 47uF

Input Voltage	5V
Output Voltage	3V
Output Current	0.3A
Switching Frequency	100kHz
Temperature	85degC





Legend model

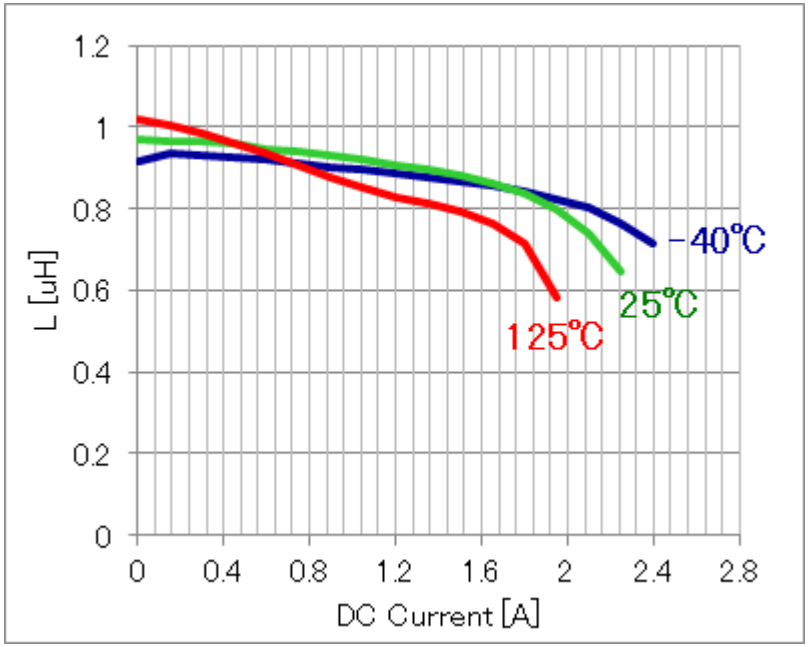
Temperature/DC bias model

Above figures are ripple waveforms of output capacitor when using Temperature/DC bias model in DC-DC converter circuit. You can find that the waveform of Temperature/DC bias model is more actual as it reflects the reduction of capacitance according to DC bias voltage different from the legend model.

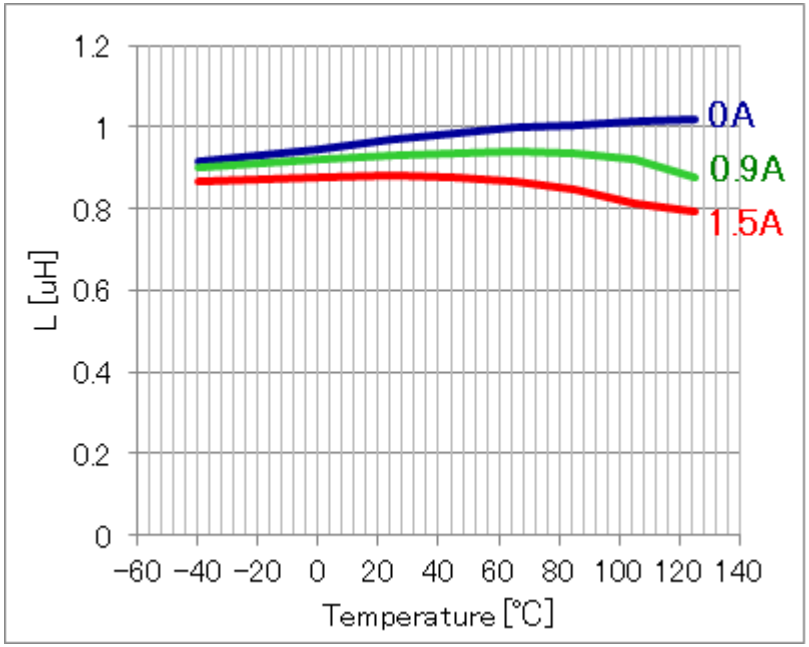
Temperature/DC Bias Characteristics of Inductors

Ferrite Power Inductor 1uH

DC Bias Characteristics (1MHz)



Temperature Characteristics (1MHz)



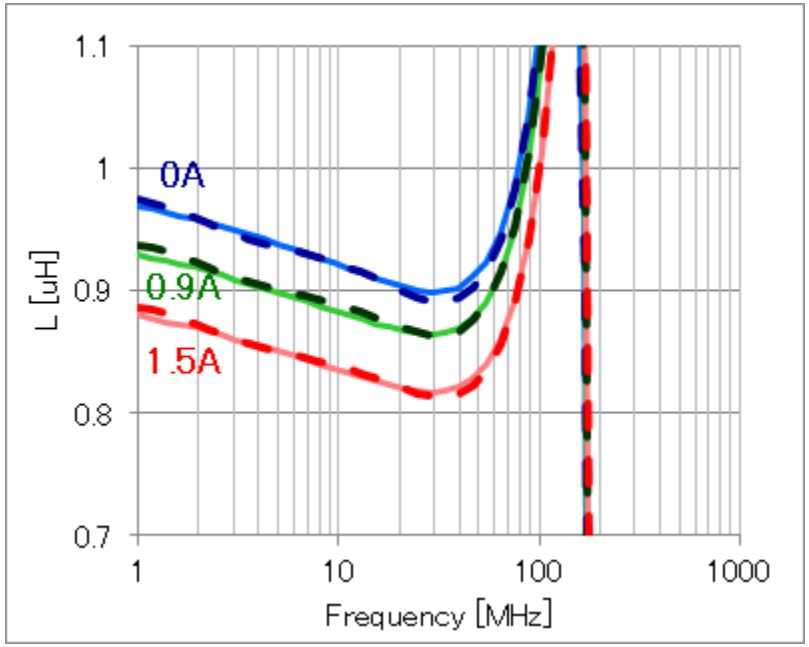
Power Inductors composed of ferrite or metal materials are known to vary their characteristics by temperature and/or DC bias current.

Therefore, temperature-DC-bias-dependent models are needed to perform simulations more precisely in condition that the ambient temperature and/or DC bias current varies.

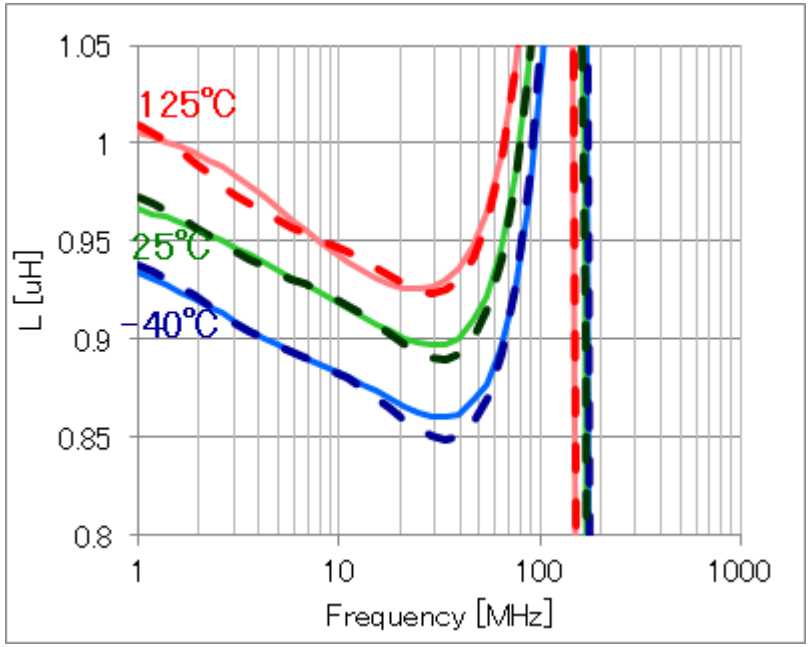
Temperature/DC bias model and measurement data

Ferrite Power Inductor 1uH

Frequency Characteristics (25C)



Frequency Characteristics (0.15A)



Measurement — — — — Temperature/DC bias model

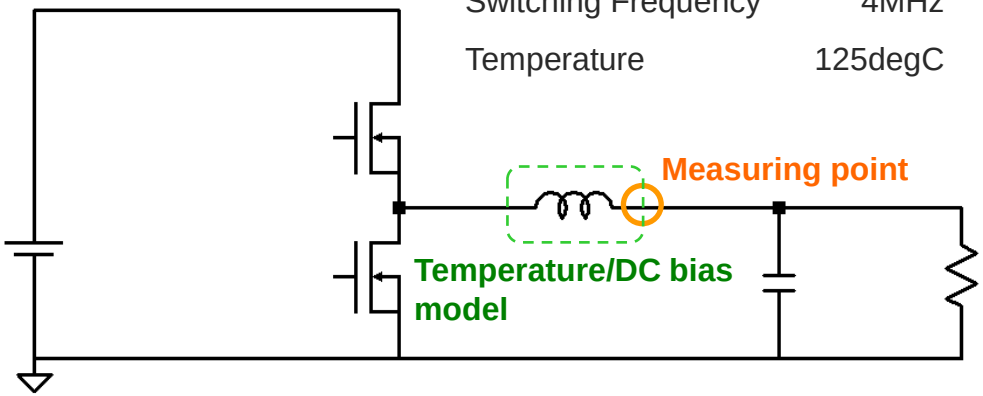
By using Temperature/DC bias model, you can perform simulations well fitting to actual data dependent on the ambient temperature and DC bias current.

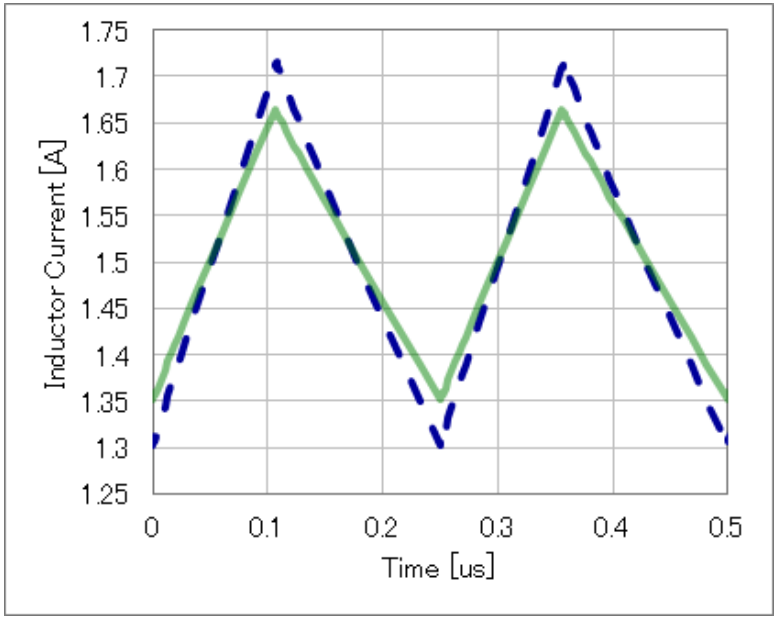
That is first achieved by Temperature/DC bias model, but not realized by the legend model.

Simulation example (DC-DC converter)

Ferrite Power Inductor 1uH

Input Voltage	5V
Output Voltage	2V
Output Current	1.5A
Switching Frequency	4MHz
Temperature	125degC





Legend model

Temperature/DC bias model

Above figures are inductor waveforms when using Temperature/DC bias model in DC-DC converter circuit. You can find that the waveform of Temperature/DC bias model is more actual as it reflects the reduction of inductance according to DC bias current different from the legend model.

TAIYO YUDEN